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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 09/945,241 | 08/31/2001 | Fumiaki Matsushima | 9319I-000277 | 1301 |

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HARNESS, DICKEY & PIERCE, P.L.C.
P.O. BOX 828
BLOOMFIELD HILLS, MI 48303

EXAMINER

NGUYEN, HA T

| ART UNIT | PAPER NUMBER |
|----------|--------------|
| 2812 | |

DATE MAILED: 06/14/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

| | | |
|------------------------------|-----------------|-------------------|
| Office Action Summary | Application No. | Applicant(s) |
| | 09/945,241 | MATSUSHIMA ET AL. |
| | Examiner | Art Unit |
| | Ha T. Nguyen | 2812 |

-- The MAILING DATE of this communication appears in the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) Responsive to communication(s) filed on 18 April 2002.
 2a) This action is FINAL. 2b) This action is non-final.
 3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4) Claim(s) 1-29 is/are pending in the application.
 4a) Of the above claim(s) 19-29 is/are withdrawn from consideration.
 5) Claim(s) _____ is/are allowed.
 6) Claim(s) 1-5,7,9,11,13 and 15-18 is/are rejected.
 7) Claim(s) 6,8,10,12 and 14 is/are objected to.
 8) Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9) The specification is objected to by the Examiner.
 10) The drawing(s) filed on 31 August 2001 is/are: a) accepted or b) objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 11) The proposed drawing correction filed on _____ is: a) approved b) disapproved by the Examiner.
 If approved, corrected drawings are required in reply to this Office action.
 12) The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 a) All b) Some * c) None of:
 1. Certified copies of the priority documents have been received.
 2. Certified copies of the priority documents have been received in Application No. _____.
 3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
 * See the attached detailed Office action for a list of the certified copies not received.
 14) Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
 a) The translation of the foreign language provisional application has been received.
 15) Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

| | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) 4 . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Notice to Applicants

1. Applicants' election with traverse of Group I, claims 1-18 with traverse in Paper No. 7 is acknowledged. The traversal is on the ground(s) the two groups of claims are drawn to subject matter which are so related to each other than an undue burden would not be placed upon the Examiner by maintaining both groups of claims in a single application. This is not found persuasive because even though there is an overlapping in the field search, each invention requires separate and additional search focusing on the specificity of the claimed method or the claimed structure is required.

The requirement is still deemed proper and is therefore made FINAL.

Claim Rejections - 35 USC § 112

1a. Claims 15-18 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 15 recites the limitation "each of the ... brazing material" in lines 4-7. It is not clear whether in each through-hole one or many metal layer(s) is(are) formed.

Claims 16-18 variously depend from claim 15, they are rejected for the same reason.

Claim Rejections - 35 USC § 102

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

- A person shall be entitled to a patent unless --
- (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
- (e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371[©] of this title before the invention thereof by the applicant for patent.

3. Claims 1-3, 5, 7 are rejected under 35 U.S.C. 102(e) as being anticipated by Watanabe et al. (U. S. Patent 6218281, hereinafter "Watanabe").

[Claim 1] Referring to Figs. 9A-9D, 10 and related text, Watanabe discloses a method for forming a bump comprising the steps of: forming a resist layer 60 so that a through-hole 61, 62 formed therein is located on a pad 47; and forming a metal layer 63 to be electrically connected to the pad conforming to the shape of the through-hole; wherein the metal layer is formed so as to have a shape in which is formed a region for receiving a soldering or brazing material;

[Claim 2] wherein the resist layer is formed so as to have a projection on the inner side of the through-hole (see Fig. 9B);

[Claim 3] wherein the resist layer is formed so that part of the resist layer remains at the center of the through-hole (see Fig. 9B);

[Claim 5] wherein the metal layer comprises first and second metal layers, wherein the first metal layer is formed in a state in which the resist layer is formed, and the second metal layer is formed on the first metal layer (see col. 13, lines 29-41);

[Claim 7] wherein the pad is covered with an insulating film, the resist layer is formed on the insulating film, an opening for exposing at least part of the pad is formed in the insulating film after forming the through-hole in the resist layer, and the first metal layer is formed on the pad in a state in which the resist layer is formed (see Fig. 9c), the examiner considers the layer 60 to be composed of two portions, the lower portion being equivalent to the claimed insulating layer and the upper portion being equivalent to the resist layer.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was

commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103[®] and potential 35 U.S.C. 102(f) or (g) prior art under 35 U.S.C. 103(a).

5. Claims 9, 11, and 13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Watanabe.

Watanabe discloses substantially the limitations of claims 9, 11, and 13, as shown above.

But it does not disclose expressly the electroless plating of the first and second metal layers and the materials used for the first and second metal layers.

However, the missing limitations are well known in the art because Watanabe discloses the use of electrolysis plating to form the bump electrode 66 and that the upper interconnect 47b can be formed of Ni (See col. 13, lines 37-41 and col. 14, lines 3-12).

A person of ordinary skill is motivated to modify Watanabe to use electroless plating to reduce production cost and to use Ni and Au as materials for the first and second metal layers to obtain better adhesion and better quality.

Therefore, it would have been obvious to use Watanabe's teaching to obtain the invention as specified in claims 9, 11, and 13.

6. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Watanabe in view of Chen (U.S. Patent 6191023).

Watanabe discloses substantially the limitations of claim 4, as shown above.

But it does not disclose expressly wherein a plurality of the through-holes are formed in the resist layer so that at least a part of each of the through-holes is superposed on the pad, and a plurality of the metal layers are formed, each of the plurality of the metal layers conforming to each of the through-holes to form the region for receiving the soldering or brazing material between the adjacent metal layers of the plurality of the metal layers on the pad.

However, the missing limitations are well known in the art because Chen discloses these features (See Figs. 1-3).

A person of ordinary skill is motivated to modify Watanabe with Chen to obtain improved adhesion to the bond pad with less thermal stress .

Therefore, it would have been obvious to combine Watanabe with Chen to obtain the invention as specified in claim 4.

7. Claims 15-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Earnworth et al. (U.S. Patent 6130148, hereinafter "Earnworth").

[Claim 15] Referring to Figs. 1A-3B and related text, Earnworth discloses a method for fabricating a semiconductor device comprising the steps of : bonding a plurality of metal layers to a plurality of leads (portion on the component 24A contacting 22A) through a soldering or brazing material 22A, each of the metal layers formed on each of a plurality of pads 26 of a semiconductor chip (see Figs. 1 F, 3A), each of the metal layers having a shape in which is formed a region for receiving the soldering or brazing material, wherein the soldering or brazing material, when melted, is allowed to flow into the region of each of the metal layers for receiving the soldering or brazing material so as not to spread onto an adjacent pad of the plurality of pads (see Fig. 3B);

[Claim 16] wherein at least one depression is formed in a side of one of the metal layers, and the soldering or brazing material is allowed to flow into the depression (see Fig. 3B);

[Claim 17] wherein one of the metal layers is formed so that a depression which is provided in the direction of the height of the metal layers is formed at the center, and the soldering or brazing material is allowed to flow into the depression (see Fig. 3B);

[Claim 18] wherein two or more metal layers of the plurality of metal layers are formed so as to be connected to one of the pads, and the soldering or brazing materials allowed to flow into a region formed between the adjacent metal layers of the plurality of metal layers on one of the pads (see Fig. 3B).

But it does not disclose all the features in a same embodiment .

A person of ordinary skill is motivated to modify Earnworth to obtain desired features suitable for each application .

Therefore, it would have been obvious to use Earnworth' s teaching to obtain the invention as specified in claims 15-18 .

Allowable Subject Matter

8. Claims 6, 8, 10, 12, and 14 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claim 6 recites "after removing the resist layer, the second metal layer is formed so as to cover a surface of the first metal layer".

These features in combination with the other elements of the claims are neither disclosed nor suggested by the prior art of record.

Claims 8, 10, 12, and 14 variously depend from claim 6, they are allowed for the same reason.

Conclusion

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ha Nguyen whose telephone number is (703)308-2706 . The examiner can normally be reached on Monday-Friday from 8:30AM to 6:00PM, except the first Friday of each bi-week.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, John Niebling, can be reached on (703) 308-3325. The fax phone number for this Group is (703) 308-7722.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is (703) 308-0956.



Primary Examiner
Ha Nguyen
06 - 10 - 02